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Journal of the Society of Arts.

FRIDAY, OCTOBER 2, 1868.

Announcements by the Council.

EXAMINATIONS, 1869.

The Programme of Examinations for 1869 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

PRIZES.

The Council, at the suggestion of the Food Committee, offer the following prizes for Improved Railway Meat Vans, Milk Vans, and Milk Cans :—

1. For an improved method of conveying meat by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which meat now suffers in its transit by rail. The principal evils to be avoided are—excessive changes of temperature, and injuries by pressure, by handling, exposure to dust, insects, &c. This prize may be awarded for an improved railway meat van or for a travelling meat larder suitable for railways.

Model on a scale of half an inch to a foot to be sent in.

2. For an improved method of conveying milk cans by by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary open trucks. The principal evils to be avoided are—the heating and shaking of the milk cans.

Model of an improved railway milk van, on a scale of half an inch to the foot, to be sent in.

3. For an improved railway milk can, the Society's ***Silver Medal*** **and £10.**

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary milk cans, or "churns." The principal evils to be avoided are—the heating of the milk, and all motion within the can which may cause the buttery particles to separate.

A specimen of the improved railway milk-can to be sent in.

The models and specimens for competition must be forwarded to the Secretary of the Society of Arts before the 1st February, 1869.

HARVESTING CORN IN WET WEATHER.

The Essay by Mr. W. A. Gibbs, of Gillwell-park, Sewardstone, Essex, for which the Gold Medal of the Society and a prize of Fifty Guineas were awarded, is now ready. Published by Messrs. Bell and Daldy, York-street, Covent-garden, publishers to the Society of Arts; price one shilling, illustrated by woodcuts.

SUBSCRIPTIONS.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

CANTOR LECTURES.

"ON FOOD." By DR. LETHEBY, M.A., M.B., &c.

LECTURE IV., DELIVERED MONDAY, FEBRUARY 10TH.

Preservation of Food—Unwholesome and Adulterated Food.

(*Continued from page* 761.)

As regards vegetable foods, they are not so liable to decay or even to parasitic infection, as animal foods; for the *acori* or *mites* of flour and sugar, or even the *weevels* of biscuit are harmless; indeed, the most important infection of grain is the fungoid disease of it, called *ergot*. This is the *muttercorn* or *roggenmutter* of the Germans, and as it chiefly infests the rye, it is named, from its appearance, *spurred rye;* but it also attacks barley, oats, wheat, maize, rice, and most of the grasses. It always appears as a black grain, of a larger size than usual, and it is mostly found in plants which grow upon moist clay soils, in damp situations, especially in the neighbourhood of forests. The district of Sologne, in France, between the rivers Loire and Cher, was once notoriously infested with the disease, and the Abbé Fessier, who was deputed in 1777 to investigate the causes of the extraordinary prevalence of ergot in that district, attributed it to the poorness and wetness of the land, and to the dampness of the air from the numerous forests. In bad seasons, as much as a third or a fourth of the crop was infected with ergot, and even in good seasons it constituted about two per cent of it. The disease in the grain is due to the growth of a peculiar fungus, which the late Mr. Quekett named *ergotetia abortifaciens;* and the effects of it on the human body are very serious. It acts chiefly on the nervous system, causing giddiness, dimness of sight, loss of feeling, and twitching of the limbs, and death by convulsions; or it produces a creeping sensation over the surface of the body, with coldness of the extremities, followed by insensibility and gangrene. These effects are no doubt referred to by Ligebert in his "History of Gaul and France," when he says that the year 1089 was a pestilent year, especially in the western parts of Lorraine, for many persons became putrid in consequence of their inward parts being consumed by St. Anthony's fire. Their limbs were rotten, and became black like coal, and they either perished miserably, or, being deprived of their putrid hands and feet, were reserved for a more miserable life. Bayle, too, in his account of this sickness, says that the bread was of a deep violet colour. The like effects have been observed in other parts of the Continent, as in Silesia, Prussia, Bohemia, Saxony, Holstein, Denmark, Switzerland, Lombardy, and Sweden, where the creeping sickness, as it is called, has attacked whole districts of the country, sparing neither old nor young, rich nor poor.

The remedy for the disease is in the hands of the miller, who should separate the ergotised from the healthy grains. Fortunately we have a ready test for its presence, not merely in the microscopic appearances of the flour, but in the circumstance that as it is the lightest of all the constituents of flour, it will float upon a mixture of one part of chloroform and six of alcohol, and will appear as a scum of dark-brown particles.

Another source of danger is the presence of poisonous grasses in the flour. The most important of these is darnel (*lolium temulentum*), which the careless or slovenly farmer will sometimes permit to overrun his fields, and the seeds becoming mixed with the corn, are ground into flour by the equally careless miller. The effect of the grains on man is to cause a species of intoxication, with headache, giddiness, somnolency, delirium, convulsions, paralysis, and even death. Occasionally it excites vomiting, with irritation of the alimentary canal, and then its effects are not so serious. Many instances are

recorded of the poisonous action of the flour. Christison, for example, tells us, that a few years ago almost all the inmates of the poor-house at Sheffield, to the number of 80, were attacked with analogous symptoms, after breakfasting on oatmeal porridge, and it was supposed that the effects were caused by the presence of darnel in the oatmeal. A similar accident is mentioned by Perleb, as having occurred at the House of Correction at Freyburg, and still more recently the same effects were produced on 74 persons at the workhouse of Beninghausen. Dr. Taylor states, on the authority of Dr. Kingsley, of Roscrea, that in the month of January, 1854, several families, including about 30 persons, suffered severely from the effects of bread containing the flour of darnel seeds. Those who partook of the bread staggered about as if they were intoxicated, and although they all recovered, yet they experienced a good deal of distress from giddiness, coldness of the limbs, and great prostration of vital power.

Unripe grain, as well as grain affected with the *rust*, and *mouldy flour* and *mouldy bread*, have also produced disturbance of the human system. M. Bouvier attributed the epidemic of dysentery, which occurred in the department of the Oise, in the autumn of 1793, to the use of *unripe grain*; and corn affected with *brown* or *black rust* is thought by many to be unwholesome. *Mouldy flour* or *mouldy bread* is certainly injurious, for several instances are on record where not only men, but horses, have been poisoned by mouldy bread; and M. Payen has given a graphic account of the distressing effects of the mouldy ammunition bread supplied to the troops who were encamped near Paris, in 1843; the mould on that occasion was a yellow fungus, the *oidium aurantiacum*, but at other times is has been of a green colour, from *pennicillum glaucum*.

Mouldy food of every description is dangerous to use, and considering to what an extent the *spores* or *sporidia* of poisonous fungi are floating in the atmosphere, it is surprising that they do not more frequently taint our food and cause disorder of the system, for air washed with distilled water will always yield abundance of these germs, which are ready at any moment to spring into activity when they come into contact with a proper nidus for their growth. A remedy for these hidden sources of danger is good and effective cooking.

And now, in conclusion, let me make a few remarks on the subject of the *fraudulent sophistications of food*—a subject which has been very popular for the last fifty years, or rather, I should say, since the year 1820, when Mr. Frederick Accum published his treatise on "Adulterations of Food, and Culinary Poisons," with the startling motto from the Book of Kings—"There is death in the pot." As you may easily imagine, such a terrible announcement by a well-known writer, could not fail to excite alarm in the public mind, and to provoke anxious curiosity. The book, therefore was eagerly sought for, and a thousand copies of it were sold within a month of its publication; so that, to use the words of the author, in his advertisement to the second edition—"there was sufficient inducement to reprint the work." The singular success of Accum's undertaking has been such a temptation to others, that the press has literally groaned with the efforts of sensational writers on this subject. And although I am ready to admit the importance of it, yet I am bound to state that it has often been grossly exaggerated, especially by those who have had but little practical knowledge to guide them.

The objects of fraudulent adulterations of food are three-fold:—

1. To increase the bulk or weight of the article.
2. To improve its appearance.
3. To give it a false strength.

Among the first of these adulterations are the following:—

(*a*) The addition of *inferior starches*, as potato-starch or English arrow-root, curcuma or East Indian arrow-root, jatropha or Brazilian arrow-root, tacca or Tahiti arrow-root, canna or Tous-les-mois starch, sago-meal, &c., *to true maranta, or West Indian arrow-root*—of which Bermuda arrow-root is the most esteemed variety. A microscopic examination of the starch or fæcula will always discover the fraud.

(*b*) The mixture of *starch-sugar* or even *starch* itself *with common cane-sugar*. Starch-sugar, or as it is sometimes called, grape-sugar, or glucose, is manufactured both in this country and on the Continent to a considerable extent. It is made from any description of starch, by boiling it for half-an-hour or so in water containing about one per cent. of sulphuric acid. The acid is then neutralised with chalk, and the liquor evaporated to a density of 1·28. While hot, it is run off clear from the insoluble precipitate of sulphate of lime, and on standing in a cool place for a few days it crystallizes or sets into a solid mass. This description of sugar has a low sweetening power—not half so great as that of cane-sugar—in fact it is produced from the latter by the action of vegetable acids and heat, when cane-sugar is added to fruit in making a tart or fruit pie, and in making jellies and jams. It is false economy, therefore, to sweeten to any extent before the tart is baked. The sugar is known by many characters, as a want of sparkle from the absence of well-formed crystals; its less solubility in water, and greater solubility in alcohol; and by its giving a deep port-wine tint to a solution of potash, when it is boiled with it.

(*c*) The dilution of *milk*, *vinegar*, &c., with *water*. This fraud is easily detected by the specific gravity of the liquid, and in the case of milk by the proportion of cream in the lactometer, and by the poor appearance of the milk when under the microscope.

(*d*) The mixture of *dripping* and *other fats* with *butter*, and *water* and *starchy* matter with *lard*. Butter and lard should always furnish, when melted, a clear-looking oil, with but little deposit of water or other substance.

The addition of *gelatine* to *isinglass*, which is sometimes so well managed that it requires a skilful analysis to detect it. Isinglass is an organised substance, and when examined with the microscope, exhibits a peculiar structure which is very characteristic of it; not so, however, with gelatine. A particle of isinglass put into cold water remains opaque, like a piece of white bread, and does not swell out; whereas gelatine becomes transparent, and enlarges a good deal in bulk. Jelly made from good isinglass has a slightly fishy smell, and is neutral to test-paper, but that from gelatine has a distinct odour of glue, and an acid reaction. Lastly, if a few grains of isinglass be burnt in a metal spoon until the ash alone remains—the ash will be very small in quantity, and of a reddish colour, while that of gelatine will be much larger in amount, and of a white appearance. Gelatine never agrees with the delicate stomach of an invalid like isinglass; and, therefore, it is often important to discover the difference.

(*f*) *Coffee* adulterated with *chicory* is readily detected by sprinkling the mixture upon water, when the coffee, which is slightly greasy from volatile and fixed oil, floats while the chicory sinks, and gives a brownish tint to the water. The experiment is easily made, as you here see, in a tumbler of water, and you may, with a little tact, determine the proportions of the mixture.

(*g*) *Wheaten flour* is frequently added to *flour of mustard*, and when the quantity passes beyond a certain amount, it is undoubtedly an adulteration, for the intention of it should be only to reduce to an agreeable extent the pungency of the mustard.

Of the second class of adulterations, where the object is to *improve the appearance of the article*, there are many examples, as:—

(*a*) The addition of *alum* to *bread*, by which, as I have already explained, inferior, and even damaged, flour may be made into a tolerable looking loaf. It is the property of alum to make the gluten tough, and to prevent its discolouration by heat, as well as to check the action of the yeast, or ferment upon it. When, therefore, it is

added to good flour, it enables it to hold more water, and so to yield a larger number of loaves; while the addition of it to bad flour prevents the softening and disintegrating effect of the yeast on the poor and inferior gluten, and so enables it to bear the action of heat in the process of baking. According to the quality of the flour will be the proportion of alum, and hence the amount will range from 2 oz. to 8 oz. per sack of flour. These proportions will yield from 9 to 37 grains of alum in the quartern loaf, quantities which are easily detected by chemical means. Indeed, there is a simple test by which much smaller quantities of it may be readily discovered. Infusion of logwood, as you here perceive, acquires a rich purplish carmine, or claret tint, when it is brought into contact with alum; you have, therefore, only to dip a slice of the bread for an instant, as I am now doing, into a weak, watery solution of logwood, and if alum be present the bread will speedily acquire a purple, or reddish purple, tint. I have already described to you the other properties of good bread, as that it should not exhibit any black specks upon the upper crust; it should not become sodden and wet at the lower part by standing; it should not become mouldy by keeping in a moderately dry place; it should be sweet and agreeable to both taste and smell; it should not give, when steeped in water, a ropy acid liquor; and a slice of it taken from the centre of the loaf should not lose more than 45 per cent. by drying.

Su'phate of copper is found to act like alum in improving the appearance of bread; and, according to Kuhlmann, Chevallier, and others, it is commonly used by the bakers of the Continent, notwithstanding the severe penalties attached to it. In this country, however, it is but rarely employed.

(*b*) *The bloom, or glaze, or facing*, of green and black tea is generally artificial. In the case of green tea, it is ordinarily a mixture of Prussian blue, turmeric, and sulphate of lime, or China clay; and in that of black tea it is not unfrequently a coating of black-lead. The tea prepared for the English market is notoriously subject to these adulterations; and it seems that it arises entirely from our own fancy, and not from any desire on the part of the Chinese to pursue such a practice. The adulteration is easily discovered by shaking the tea with cold water, and then straining through muslin, and allowing the fine powder to subside.

(*c*) *Pickles* and *preserved fruits* are often made green with a salt of copper, it being the peculiar property of that metal to mordant, or fix in an insoluble form, the green colouring matter or *chlorophyll* of vegetables. If, therefore, the pickling operation is conducted in copper vessels, or if a little verdigris or sulphate of copper is added to the vinegar in which the vegetables are boiled, the colour of them will be retained. In some cases the quantity added has been so large as to give a coppery look to a steel fork or knife plunged into the pickle. In such cases, as might be expected, severe symptoms of poisoning have been occasioned by it.

(*d*) *Ferruginous earth*, or *red oxide of iron*, is frequently added to sauces, to anchovies, to cocoa preparations, and to preserved or potted meats, to improve their appearance.

(*e*) *Mineral pigments*, often of a poisonous nature, are used in colouring confectionary.

And lastly, with the view of giving a *false strength to the article*, we have instances of *sulphuric acid* added to *vinegar*, *black-jack* or burnt sugar to *coffee* and *chicory*, *catechu* or *terra japonica* to *tea*, *cocculus indicus* to *beer*, *cayenne* to *peppers*, &c.

That many of these sophistications are dangerous there can be no doubt, and all of them are frauds on the public. Parliament has therefore attempted to deal with the matter by legislation, as in the "Act for Preventing the Adulteration of Articles of Food or Drink" (23rd and 24th Vict., cap. 84) of 1860; but as the act is only permissive, little or no effect has been given to it. Even in those places, as in the City of London, where it has been put into operation, and public analysts have been appointed, no good has resulted from it; in fact, it stands upon the statute-book as a dead letter. Speaking for the City, I may say that every inducement has been offered for the effective working of the act, but nothing has come of it. In olden time the remedies for such misdemeanours were quick and effectual. In the *Assisa panis*, for example, as set forth in *Liber albus*, there are not only the strictest regulations concerning the manner in which the business of the baker is to be conducted, but there are also the penalties for failing in the same. "If any default," it says, "shall be found in the bread of a baker in the City, the first time let him be drawn upon a hurdle from the Guildhall to his own house through the great streets where there be most people assembled, and through the great streets which are most dirty, with the faulty loaf hanging from his neck; if a second time he shall be found committing the same offence, let him be drawn from the Guildhall through the great street of Cheepe, in manner aforesaid, to the pillory, and let him be put upon the pillory, and remain there at least one hour in the day; and the third time that such default shall be found, he shall be drawn, and the oven shall be pulled down, and the baker made to forswear the trade within the City for ever." It further tells us that William de Stratford suffered this punishment for selling bread of short weight, and John de Strode for making bread of filth and cobwebs. One hoary-headed offender was excused the hurdle on account of his age and the severity of the season; and it would seem that the last time the punishment was inflicted was in the sixteenth year of the reign of Henry VI., when Simon Frensshe was so drawn. A like punishment was awarded to butchers and vintners for fraudulent dealings; for we are told that a butcher was paraded through the streets with his face to the horse's tail, for selling measly bacon at market, and that the next day he was set in the pillory with two great pieces of his measly bacon over his head, and a writing which set forth his crimes. In the judgments recorded in *Liber albus* there are twenty-three cases in which the pillory or the thew was awarded for selling putrid meat, fish, or poultry; thirteen for unlawful dealings of bakers, and six for the misdemeanours of vintners and wine-drawers. Of a verity we have degenerated in these matters.

And now, in conclusion, having directed your attention to the nutritive values of different kinds of food; to their functional and dietetical powers; to the modes in which they are associated; to the quantities required for ordinary labour; to the manner in which they are digested; to the effects of culinary and other treatment; to the way in which they may be preserved; and to the causes of their unwholesomeness, we may finally ask if any great generalisations can be deduced from our inquiries?

In the first place, you will, I think, have observed that there are very striking evidences of design in the way in which organic matter is constantly kept in motion, for, whether living or dead, it is always in a state of molecular activity—either advancing towards the highest state of organisation, or retreating to the confines of the mineral kingdom. The result of this is that, with a comparatively small amount of material, and with but little expenditure of force, the work of the living world is fully and effectively performed. Starting from the mineral kingdom, as carbonic acid, water and ammonia, the elements of organic nature pass through a succession of changes, first in the vegetable and next in the animal, until they reach the summit of organization, when they again return to their primitive condition. In this manner a never-ending round of change is perpetuated, and the same material and the same force are kept moving in the same continuous circle. Through the efforts of the plant the crude materials are formed into vegetable acids, sugar, gum, starch, fat, albumen, and tissue; and then the animal converts them into higher forms of structure, as gelatine, muscle, and brain;

the two extremes, therefore, of these changes are, to use the words of Gerhardt, carbonic acid, water, and ammonia at one end; albumen, gelatine, fat, and cerebral matter at the other—but the transitions to these extremes are countless, and are as yet beyond the reach of science. Broadly, however, we may say that the chemical functions of the plant are those of reduction or deoxydation, whereby carbonic acid and water are deprived of their oxygen and moulded with nitrogen into food; while those of animals are of an opposite nature, for they destroy this food by oxydation. The plant, therefore, is the machine or medium whereby carbonic acid, water, and ammonia, are converted into new compounds, and light and heat are transformed into chemical affinity; and the animal is the medium or machine whereby these compounds are destroyed, and their affinities changed into other manifestations of force, and finally into heat. In this way, the circuit of change is completed; and it is not difficult to trace the phenomena of vitality to the cosmical forces which the plant had imprisoned. But shall we ever be able to follow, through all the intricacies of change, the countless transitions of both matter and force in their passage from the mineral kingdom to the animal, and then back to the mineral again? It is easy to connect, by a correlation of force, the muscular movements of the animal body, and even the highest efforts of the human mind, with the sunbeam which the plant had arrested; but shall we ever be permitted to unravel those mysterious functions, those intermediate changes which constitute the phenomena of life? Why is it, for example, and how comes it, that the living cell of the plant is able to aggregate mineral matter in opposition to the common laws of affinity, and can transform light and heat into cell-force? How is it, too, that the animal, in reversing the process, and so restoring the play of affinity, is able to transmute it into other manifestations of force? At present, the utmost we can say of it is, that organic matter is the appointed medium of all these changes, and is designed for the exhibition of vital phenomena, just as mineral matter is the appointed medium for the phenomena of electricity and magnetism; and yet to some extent, perhaps, we are able to penetrate the mystery; for by finding the clue to the peculiar action of the vegetable in reducing chemical compounds, we can, by operating on such substances as carbonic acid, water, and ammonia, produce a large number of organic principles; in fact, of the three great classes of alimentary substances, to which I have so frequently directed your attention—namely, the oleaginous, the saccharine, and the albuminous—it may be said that the first is already within the manufacturing power of the chemist, and the second is nearly within it; so that there is abundant proof that the agency of a vital force is not necessary to the formation of organic compounds; and there is even hope that the fabrication of food may not be altogether beyond the capabilities of man.

Proceedings of Institutions.

Yorkshire Union of Mechanics' Institutes.—*Bradford Mechanics' Institute.*—On September 28th the annual soirée was held in the lecture-hall of the institute, the Rev. Dr. Campbell, president, in the chair. The attendance was large. The chairman opened the proceedings by drawing attention to the fact that the institute was now 36 years old. It had passed through the difficulties of early life, and was flourishing in all its departments, the only difficulty now being the want of room, which would be remedied in the new building proposed to be erected, which, whatever name might be given to it, would perhaps be found to be the People's College, open for all classes of the community. After a reference to the classes, the lectures, the news-room, and the prizes, he proceeded to discharge the duty of presenting the prizes and certificates to the pupils, accompanying each with a pleasant word to the recipients. He then resumed his address, and, alluding to the new institute, he said that an offer of £500 from Mr. H. W. Ripley some years ago had spurred them on towards the erection of a new building. Mr. Ripley coupled with his offer the condition that an industrial museum should be connected with the institute, but the directors, finding that there were difficulties in the way, told Mr. Ripley, and he at once offered the money without any condition at all. A scheme was then proposed to erect a large building, costing £40,000, and to have all the literary and scientific institutions of the town under one roof. That scheme, however, fell through, although Mr. Ripley had offered a tenth of whatever they might spend, and the directors proposed to keep to the same proportion, and put him down for £1,200, or one-tenth of the sum to be spent on the building at Bowling-green. Mr. Titus Salt, ever ready and generous, offered £1,000; Mr. M. W. Thompson, M.P., £500, and more if they wanted it; Mr. James Law (the mayor), who always had taken, and still continued to take, an active part in the management of the institute, together with his partners, offered £400; Mr. W. E. Forster, M.P., £150, as a private individual, and not as member for Bradford; Mr. Ald. Brown, £100, who had offered £500 to the general institute plan, and who, it was hoped, would contribute that amount to the present scheme; the venerable Dr. Godwin, whom they all revered, and Mr. Ald. J. V. Godwin, his son, £150; Mr. C. Lund, their treasurer, who had watched with a severe jealousy over their finances for many years, gave £100; Mr. Ald. Semon, who was unavoidably prevented being present that evening, and who took great interest in the institute, £250; the junior members of the firm at Saltaire, following in their father's footsteps, contributed £500; Messrs. Kell had promised £100; and Mr. H. Harris had sent a note offering £300, and with a promise that hereafter, if it was required, more might be forthcoming. The President concluded by expressing the hope that, with almost half of the amount offered that would be required for the new scheme there was no ground to fear that the undertaking would not be fully carried out.—Mr. H. W. Ripley, who was received with applause, after alluding to the advanced classes, said that in the future it was to be hoped primary education would no longer be necessary in mechanics' institutes, but would be so completely given that the higher branches of education would alone have to be taught, and this rendered the importance of mechanics' institutes far greater. He then urged the necessity of technical education, drew attention to the successful working of polytechnic schools on the Continent, and urged the directors of the institute not to be hasty in deciding what they would spend on a building, and rather to delay, and to expend £20,000 on a structure worthy of the purpose it was intended to subserve, and of the town, than to cramp its operations by a smaller expenditure.—Addresses were afterwards delivered by the Rev. W. Kingsland, the Mayor, Mr. J. Behrens, and other gentlemen. *Rothwell Mechanics' Institute.*—The Committee have advertised for tenders for the erection of a new building. It is to consist of a good-sized hall, 55 feet long by 33 feet wide, library, reading and class rooms, with ante-room to the large hall, and other conveniences. The efforts of the working classes of Rothwell are deserving of every encouragement, as the institution has, under great difficulties, steadily increased its numbers and usefulness, and now consists of 128 members, chiefly miners and artisans. The only building they at present have is an upper floor of an old malt kiln. There is no room in the town available for a concert or entertainment. The late Mr. Calverley, of Oulton-hall, very handsomely gave an eligible site for the building, also a donation of £100. The contributions from the working classes are very numerous and liberal, according to their means. There still remains a considerable sum to be raised, and it is hoped the well-wishers of the cause will see the institution opened free of incumbrance.

EXAMINATION PAPERS, 1868.

(*Continued from page 751.*)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

LATIN AND ROMAN HISTORY.

Section I.

Translate:—

Sic ubi deseruit madidos septemfluus agros
Nilus, et antiquo sua flumina reddidit alveo,
Aetherioque recens exarsit sidere limus,
Plurima cultores versis animalia glebis
Inveniunt, et in his quaedam modo coepta sub ipsum
Nascendi spatium, quaedam imperfecta suisque
Trunca vident numeris, et eodem in corpore saepe
Altera pars vivit, rudis est pars altera tellus.
Quippe ubi temperiem sumpsere humorque calorque,
Concipiunt, et ab his oriuntur cuncta duobus.
Cumque sit ignis aquae pugnax, vapor humidus omnes
Res creat, et discors concordia fetibus apta est.
Ergo ubi diluvio tellus lutulenta recenti
Solibus aetheriis altoque recanduit aestu,
Edidit innumeras species, partimque figuras
Rettulit antiquas, partim nova monstra creavit.
Illa quidem nollet, sed te quoque, maxime Python,
Tum genuit, populisque novis, incognite serpens,
Terror eras; tantum spatii de monte tenebas.

1. Parse fully, giving both accidence and syntax, the words deseruit, nascendi, numeris, aquæ, fetibus, nollet.
2. Give the present and perfect tenses indicative and the supines of the verbs exarsit, concipiunt, rettulit, tenebas.

Section II.

Translate:—

Redeuntem colle Lycaeo
Pan videt hanc, pinuque caput praecinctus acuta
Talia verba refert—Restabat verba referre,
Et precibus spretis fugisse per avia nympham,
Donec arenosi placidum Ladonis ad amnem
Venerit; hic illi cursum impedientibus undis,
Ut se mutarent, liquidas orasse sorores:
Panaque cum prensam sibi iam Syringa putaret,
Corpore pro nymphae calamos tenuisse palustres:
Dumque ibi suspirat, motos in arundine ventos
Effecisse sonum tenuem similemque querenti.
Arte nova vocisque deum dulcedine captum
"Hoc mihi concilium tecum" dixisse "manebit."
Atque ita disparibus calamis compagine cerae
Inter se iunctis nomen tenuisse puellae.
Talia dicturus vidit Cyllenius omnes
Succubuisse oculos, adopertaque lumina somno.

1. Parse fully, giving both accidence and syntax, the words caput, precibus, illi, querenti, compagine, succuquisse.
2. Turn the following four lines into the *oratio recta*:—

Dumque ibi suspirat, motos in arundine ventos
Effecisse sonum tenuem, similemque querenti;
Arte novâ vocisque Deum dulcedine captum,
Hoc mihi concilium tecum, dixisse, manebit.

Section III.

Translate:—

Ego autem, etsi vereor laudare praesentem, iudico tamen de re obscura atque difficili a te dictum esse dilucide, neque sententiis solum copiose, sed verbis etiam ornatius quam solent vestri. Zenonem, quem Philo noster coryphaeum appellare Epicureorum solebat, quum Athenis essem, audiebam frequenter et quidem ipso auctore Philone, credo, ut facilius iudicarem quam illa bene refellerentur, quum a principe Epicureorum accepissem quem ad modum dicerentur. Non igitur ille, ut plerique, sed isto modo, ut tu, distincte, graviter, ornate. Sed quod in illo mihi usu saepe venit, idem modo, quum te audirem, accidebat, ut moleste ferrem tantum ingenium—bona venia me audies—in tam leves, ne dicam in tam ineptas, sententias incidisse. Nec ego nunc ipse aliquid adferam melius. Ut enim modo dixi, omnibus fere in rebus et maxime in physicis quid non sit citius quam quid sit dixerim.

1. Parse fully, giving both accidence and syntax, the words sententiis, auctore, refellerentur, veniâ, incidisse, sit.
2. Give the present and perfect tenses indicative and the supines of the verbs accepissem, dicerentur, accidebat, adferam.

Section IV.

Translate:—

Etenim si semel, Vellei, suscipimus genus hoc argumenti, attende quo serpat. Tu enim sumebas nisi in hominis figura rationem inesse non posse: sumet alius nisi in terrestri, nisi in eo, qui natus sit, nisi in eo, qui adoleverit, nisi in eo, qui didicerit, nisi in eo, qui ex animo constet et corpore caduco et infirmo, postremo nisi in homine atque mortali. Quod si in omnibus his rebus obsistis, quid est quod te una forma non turbet? His enim omnibus, quae proposui, adjunctis in homine rationem esse et mentem videbas. Quibus detractis deum tamen nosse te dicis, modo lineamenta maneant. Hoc est non considerare, sed quasi sortiri quid loquare. Nisi forte ne hoc quidem attendis, non modo in homine, sed etiam in arbore quidquid supervacaneum sit aut usum non habeat obstare. Quam molestum est uno digito plus habere! Quid ita? quia nec ad speciem nec ad usum alium quinque desiderant. Tuus autem deus non digito uno redundat, sed capite, collo, cervicibus, lateribus, alvo, tergo, poplitibus, manibus, pedibus, feminibus, cruribus.

1. Parse fully, giving both accidence and syntax, terrestri, adjunctis, sortiri, digito, cervicibus.
2. Account for the mood of serpat, maneant, loquare, sit.

Section V.

1. Give an account of the Servian Constitution.
2. What was the origin of the Tribunate?
3. Give an account of the capture of Rome by the Gauls.
4. By what successive steps did Rome rise to supremacy over Italy?
5. Write a short history of the Roman navy down to the end of the Third Punic War.
6. Give an account of Cincinnatus.

Section VI.

1. Give an account of the War with Jugurtha.
2. Describe the duties, powers, and mode of appointment of the consul, censor, prætor, quæstor, curule ædile.
3. How did the later aristocratic and democratic parties differ from the earlier?
4. Write a short life of Pompey.
5. Describe the character of Cicero.
6. Describe the struggle between Octavius and Antony.

FRENCH.

THREE HOURS ALLOWED.

Part. I.

Candidates for a third-class certificate are to translate the following extract into English, and to answer the grammatical questions thereto annexed, in the order in which they are placed. This first part is all that is required of them.

Dire que la poudre à canon a été la première cause qui ait rendu les guerres plus rares, semble une proposition qui a droit d'étonner; cependant l'invention de la poudre est le premier des faits intellectuels qui ont amené ce résultat. Quand le premier coup de canon eut retenti, il se fit un grand changement dans la pratique de la guerre. Alors commencèrent à disparaître ces armées indisciplinées, mal préparées, mal équipées, qui se composaient non d'une classe d'hommes, mais de tous

les hommes pouvant porter une arme. Ce coup de canon qui ébranla le premier le sol d'un champ de bataille mit en fuite la tourbe de ces demi-soldats avec lesquels on faisait la guerre. Il fallut désormais des arquebuses, des mousquets, des canons, des bombes, des mortiers, des grenades. Il fallut des hommes à part pour manœuvrer les nouveaux engins; il fallut beaucoup d'armes pour équiper une armée, de longs exercices pour l'aguerrir; il fallut des troupes permanentes. Jusque-là tout homme qui n'était pas d'église était plus ou moins soldat; dès lors il y eut une masse considérable d'hommes qui ne furent ni d'église ni soldats; il y eut une ligne intermédiaire qui devint une large voie entre la théologie et la guerre, une carrière vaste qui renferme désormais la nation tout entière, dévouée aux arts de la paix, vivant de l'intelligence, représentant la civilisation moderne, répandant les bienfaits de l'éducation, enseignant ses législateurs, contrôlant—elle en a du moins le droit—ses chefs et ses rois, établissant avant toute chose sur une base solide cette suprématie de l'opinion publique devant laquelle non-seulement les princes constitutionnels, mais encore les souverains absolus sont strictement responsables.

Quand les classes commerciales repoussent l'idée de la guerre, elles obéissent confusément à une loi intellectuelle. C'est le second fait qui explique la décadence de l'esprit guerrier: ce fait, qui est tout entier du domaine de l'intelligence, s'appelle l'économie politique. Sans doute il n'y a pas un marchand sur cent qui soit familier avec les principes de cette science; pourtant ils obéissent à ces principes comme s'ils les connaissaient, comme s'ils les comprenaient. Ils se soumettent à l'esprit de leur temps, et cet esprit n'est autre que l'ensemble des connaissances humaines. L'économie politique en forme une part considérable; c'est la seule branche de l'art de gouverner les hommes qui ait été amenée à la rigueur d'une science. Or, l'économie politique est une exhortation perpétuelle à la paix.

* * * * *

Parmi les bienfaits dont nous sommes redevables au progrès, il convient de faire une bonne place à la facilité des communications. C'est le troisième fait intellectuel qui diminue les chances de guerre entre les nations civilisées. La vapeur a été plus puissante qu'aucun précepte moral pour restreindre l'amour de la guerre. D'où venaient le mépris et la haine qui éloignaient l'un de l'autre les deux peuples les plus civilisés de la terre? Ils ne se voyaient pas, ils ne se connaissaient pas. . . . . En rapprochant les nations, la vapeur les a forcées à se connaître et à s'estimer. Elle a été un lien de charité internationale; elle vaut à elle seule autant que bien des leçons de moralistes pour apprendre à un peuple à aimer son prochain.

L. Étienne.

1. Parse the first two sentences of the above extract (down to "*de la guerre.*")

2. Give the five primitive tenses of the verbs:—*Dire, se fit, disparaître, pouvant, mit, fallut, devint, vivant, obéissent, connaissaient, comprenaient, restreindre, voyaient, vaut, apprendre.*

3. "Le premier des faits" (4th line). "Il fallut des arquebuses, &c." (13th line). Explain the meaning and nature of "des" in either case, and state, with examples, when the partitive article "des" must be changed into "de."

4. "Ces demi-soldats" (12th line). Why does not "demi" agree with "soldats" here? State the rule, and name the other adjectives to which the same rule applies.

5. Give the adjective corresponding to each of the following nouns that occur in the above extract:—*Guerre, pratique, champ, soldat, église, théologie, nation, art, paix, bienfait, prince, idée, loi, esprit, économie, science, temps, rigueur, progrès, mépris, haine, terre, charité.*

6. Give the adverb corresponding to each of the following adjectives:—*Premier, grand, tout, demi, nouveau, long, large, entier, solide, public, absolu, familier, seul, bon, puissant, moral.*

7. Translate into French:—"A marble table," "Burgundy wine," "a writing table," "olive oil," "lamp oil," "a wine glass," "a glass of wine," "a windmill," "a paper bag," "a paper basket," "a four-wheel carriage."

8. Write in the plural the following words:—"Tête-à-tête," "passe-partout," "in-quarto," "casse-cou," "porte-monnaie," "serre-tête," "appui-main," "pied-à-terre."

9. Translate in French, writing it in full:—*London, May 5th*, 1868, and give the rule concerning the words *cent, vingt*, and *mille.*

10. Explain why the word *tout* varies in this sentence:—"Tout habile et toute spirituelle qu'est cette personne, elle ne réussit pas."

11. Show the modifications which certain words undergo in French for the sake of *euphony.* Give as many different instances as possible.

12. Conjugate the imperfect indicative, and the imperative of the verbs:—*Courir, fuir, tenir, se repentir, savoir, voir, craindre, prendre, rire, vivre.*

Part II.

Candidates for a second-class certificate are to answer questions 9, 10, and 11 in Part I., together with those in Part II., and to translate the English extract and idiomatic expressions which follow.

Grammar.

1. In the first sentence of the French extract in Part I. there occurs this apparent anomaly—that whilst in "la première cause qui *ait* rendu, &c.," the verb is construed in the subjunctive mood, the indicative mood is used in "le premier des faits intellectuels qui *ont* amené, &c." Can you explain this difference?

2. When are you to translate "it is" by "*ce* sont," and not by "c'est"? Give examples.

3. When should "it is" immediately before an adjective be rendered by "il est," and when by "c'est"?

4. Give, with suitable examples, any three important rules on the syntax of personal or possessive pronouns in French.

5. Distinguish between "les César et les Napoléon," "les Pitt et les Cobourg," and "les Césars et les Napoléons," "les Pitts et les Cobourgs."

6. Explain the difference of meaning between "Il se plaint qu'on l'a volé," and "Il se plaint qu'on l'ait volé." Distinguish also between "Cela impose" and "Cela en impose," between "participer à" and "participer de,"—and between "servir à rien" and "servir de rien."

Translation.

It is an extraordinary thing that man, with a mind so wonderful that there is nothing to compare with it elsewhere in the known creation, should leave it to run wild in respect of its highest elements and qualities. He has a power of comparison and judgment, by which his final resolves, and all those acts of his material system which distinguish him from the brutes, are guided: shall he omit to educate and improve them when education can do much? Is it towards the very principles and privileges that distinguish him above other creatures he should feel indifference? Because the education is internal, it is not the less needful; nor is it more the duty of a man that he should cause his child to be taught than that he should teach himself. Indolence may tempt him to neglect the self-examination and experience which form his school, and weariness may induce the evasion of the necessary practices; but surely a thought of the prize should suffice to stimulate him to the requisite exertion; and to those who reflect upon the many hours and days devoted by a lover of sweet sounds to gain a moderate facility upon a mere mechanical instrument, it ought to bring a blush of shame, if they feel convicted of neglecting the beautiful

living instrument wherein play all the powers of the mind.— FARADAY.

Idioms.

1. Il a pris fait et cause pour moi ; sans quoi on m'aurait donné du fil à retordre.
2. Nous avons eu maille à partir ensemble.
3. Il est resté sur le carreau.
4. Je suis au bout de mon latin.
5. Je n'y suis pour rien.
6. Vous n'y êtes pas à beaucoup près.
7. Vous trouverez chaussure à votre pied.
8. Il mesure toujours les autres à son aune.
9. Partageons le différend.
10. On lui a monté la tête.
11. Ne vous faites donc pas tant tirer l'oreille.
12. Il va toujours son petit bonhomme de chemin.

PART III.

Candidates for a first-class certificate are expected to translate the above idioms and English extract, and to answer in French the grammatical questions 2, 3, and 6 in Part II., as also the following :—

Literature.

1. State what you know of either Marot or Malherbe.
2. Trace the Italian influence through the literature of France during the reigns of the three last Valois.
3. What was the *Pléiade ?* And what do you know of the *Satire Ménippée ?*

History.

Sketch the character of Charlemagne as a legislator.

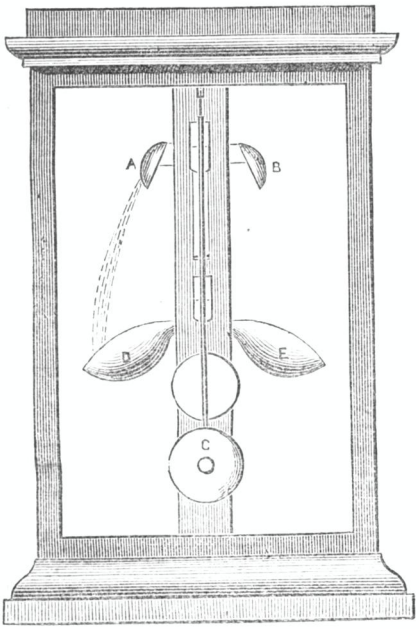
(*To be continued.*)

HYDRAULIC CLOCK.

The following particulars have been forwarded by Mr. W. A. Gilbee, South-street, Finsbury :—

This clock, according to the statements of the inventor, keeps very correct time, is extremely simple in its construction, and in no way resembles the clepsydra of the ancients.

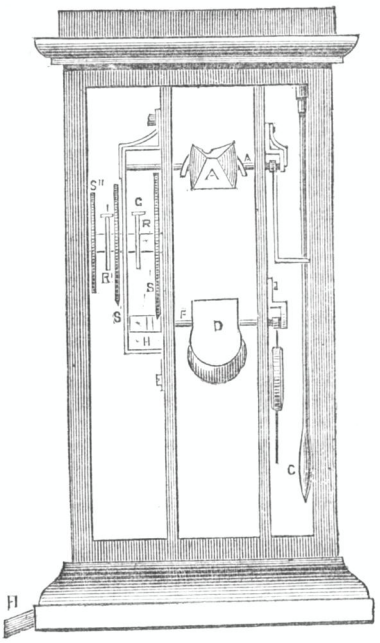
FIG. 1.



In the engravings, Fig 1 is a back elevation ; Fig. 2, a side elevation ; Fig. 3, a front elevation, the hands being shown in dotted lines) ; and Fig. 4, a plan of this improved water clock.

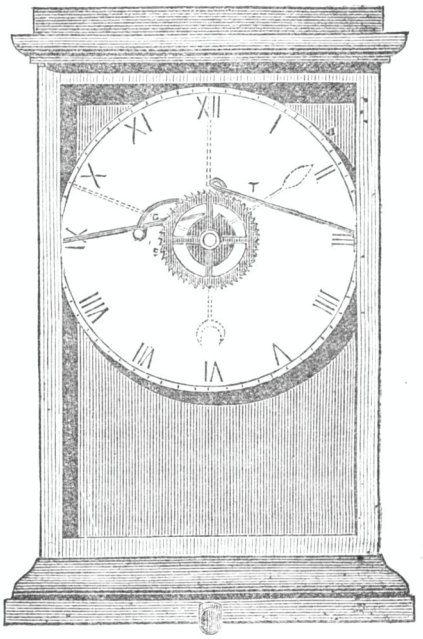
As its name implies, the motive power of the

FIG 2



clock is water, which is maintained at a constant level in the reservoir, P, on the top, from a continuous flow ; the water passes from this reservoir through a small inclined opening, *p*, into a vessel divided into two equal compartments, A and B,

FIG 3.

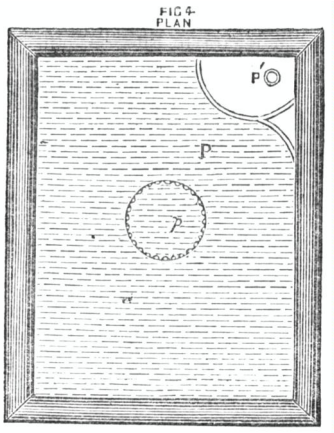


and attached at right-angles to the axis of a rod, A', acting on the pendulum, C. When the pendulum, after

losing the vertical position, begins to oscillate, the aforesaid vessel brings its two compartments successively under the orifice of the reservoir, in such a way that when one falls through the weight of the water, the other rises, thus producing the movement which maintains the oscillation of the pendulum, which in its turn regulates the rate of movement. At each oscillation of the pendulum, the water falls from the aforesaid vessel into a second vessel, D, E, causing it to oscillate isochronally with the pendulum. This vessel, D, E, by means of a click on its arbor, moves the first wheel, S (cut with 60 ratchet teeth), one tooth, and as the socket of this wheel carries the seconds' hand, the latter thus moves over a second at each vibration of the pendulum.

When this wheel, S, has completed one revolution (and the seconds' hand passed once round the dial), the cam, R, which has raised the lever, G, lets it fall, causing the click, *l*, to move the wheel, S′, one tooth, and as the socket of this wheel carries the minute hand, the latter moves over a minute on the dial. This wheel, S′, in like manner, moves the third or hour wheel, S″, by means of the cam, R′, and lever, *i*.

A spring, T, is adapted to each wheel to keep it from moving too easily. P′ is the overflow pipe from the reservoir.



If desired, an aquarium may be placed in the lower part of the clock case, the falling water keeping up a running stream for fish, &c., the overflow being carried off by a pipe.

This ingeniously contrived clock, not only by its simple mechanism, but also by its continuous action (as it never requires winding up), and its extreme accuracy as a time measurer, offers (says the inventor) a prospect of very advantageous results; and the moderate price at which it can be made will place it within the reach of the humblest class. At the same time it will form an equally useful ornament for the garden, hot-house, or public places, for the drawing-room or kitchen.

AGRICULTURAL RETURNS OF GREAT BRITAIN FOR 1868.

It has not been practicable to obtain from all parts of England and Wales the information necessary for the completion of the Agricultural Returns for this year until the present date.

With the view of making known, as early as possible, the chief results exhibited by the returns, the following particulars are furnished in anticipation of the publication of the returns in detail:—

Extent of Land in Great Britain under

	Wheat.	Barley.	Oats.
	Acres.	Acres.	Acres.
1866..	3,350,394	2,237,329	2,759,923
1867..	3,367,876	2,259,164	2,750,487
1868..	3,646,260	2,149,201	2,753,840
	Increase (+), or Decrease (—).		
1868 over 1867	+ 278,384	— 109,963	+ 2,753
	or 8·2 per cent.	or 4·9 per cent.	or 0·1 per cent.
1868 over 1866	+ 295,866	— 88,128	— 6,683
	or 8·8 per cent.	or 4·0 per cent.	or 0·3 per cent.

Total No. of Live Stock in Great Britain upon 25th of June.

	Cattle.	Sheep.	Pigs.
1867..	4,993,034	28,919,101	2,966,979
1868..	5,416,154	30,685,980	2,303,857
	Increase (+), or Decrease (—).		
1868 over 1867	+423,120	+ 1,766,879	— 663,122
	or 8·5 per cent.	or 6·1 per cent.	or 22·3 per cent.

The acreage of land in Great Britain under potatoes in 1868 was 539,954—against 492,217 in 1867, and 498,843 in 1866.

The acreage under hops in 1868 was 64,488—against 64,284 in 1867, and 56,578 in 1866.

Statistical Department, Board of Trade,
23rd September, 1868.

APPARATUS FOR LIFTING SHIPS.

The following account of a trial of an apparatus for this purpose, invented by Mr. Maquay, is extracted from the *Geelong Advertiser*, of July 15th:—

The first public trial of Mr. Maquay's ship-lifting apparatus was made yesterday, in Corio Bay, and the success attained was so complete as to fully justify all the expectations of the company who have become the proprietors of the patent, and, on the strength of it, have, we believe, bought the sunken steamer, the *City of Launceston*. A barge was moored about a quarter of a mile from the shore, in five fathoms of water; at the stern of this barge a smaller one, twenty feet in length and ten feet broad, laden with chains and stones, to the extent of ten tons, had been sunk, and it was this heavy mass which it was proposed to lift bodily from the muddy bottom.

The following is a description of the apparatus employed:—A strong iron cylinder, 3 feet 6 inches in height, with a diameter of 2 feet 6 inches, is half filled with water; in this are placed 50 lbs. of zinc and a carboy containing 112 lbs. of sulphuric acid. The cylinder, which weighs about a ton, is then lowered on to the vessel it is proposed to raise; two large circular pieces of prepared canvas, 22 feet in diameter, having previously, by means of a network of ropes, the lower ends being gathered together round circles of rope, been formed into the shape of balloons, with a capacity of 240 cubic feet each, are lowered down, and, by means of angle-irons and chains, firmly affixed to the sunken body. All having been made ready by a diver, he strikes an iron bar passing through an aperture at the top of the cylinder and bearing upon the glass

carboy of sulphuric acid, which it smashes, and causes the acid to mix with the zinc and water, and thus coming in contact with the oxide of zinc quickly causes hydrogen gas to generate. This is then conveyed to the two balloons through two india-rubber tubes affixed to two taps on the cylinder, and the balloons becoming inflated with a gas fourteen and a-half times lighter than the atmosphere we breathe, quickly rises to the surface of the water—that is to say, if the dead weight they are fastened to is not too heavy—and it is calculated that each of them, when fully inflated, will lift ten tons of dead weight through water, though, judging by yesterday's experiment, they will lift a great deal more than this. As the weight required to be raised yesterday was only ten tons, only one balloon was called into requisition, and only half a charge of acid and zinc placed in the cylinder. Everything having been got ready for the lowering of the cylinder, Mr. Maquay—who, by-the-bye is a first-class diver—donned his 146 lb. weight diving dress. He went over the side of the vessel, and quick was the word given to the men at the air-pump to "blow away." After a lapse of a few minutes, the sign was given from below to lower the cylinder; this was done, when again there came a check, Mr. Maquay finding that the cylinder had not landed in the centre of the barge. This was, however, quickly remedied, and after the lapse of half-an-hour up comes the diver again with the information that one of the guy-ropes had broken, causing the cylinder to lie on one side, and that one end of the barge had sunk into the oosy mud. This information caused much anxiety, as it was feared the cylinder might topple over and make the carboy burst before everything was ready. After two or three such drawbacks, which always occur on a first trial, the signal was given, and the balloon was lowered into the water, and firmly fixed to the chains placed athwart the punt. A thud was heard, proving the iron carboy smasher to have been struck, and then all were on the *qui vive* wishing to see the balloon inflate. There was a great rush of air to the surface of the water, and many thought the balloon had burst, but this was simply impossible—for if too much gas came out of the tube it would escape from under the balloon; the commotion on the water was caused by the escape of the atmospheric air which the bag contained when it went down. Gradually it could be seen the balloon was inflating, but it was at the same time discerned that the stuff of which it was made, viz., canvas, with a coating of gutta-percha steeped in naptha, was not air-tight. The escape of gas was not, however, commensurate with the supply, and at the lapse of eleven minutes the balloon, having detached the punt from the bottom, came up with a jump, and rose three or four feet out of the water, the punt being suspended eighteen feet at least from the bottom, and was being kept in suspense when our reporter left, showing that it could easily be towed into shallow water and secured. The diver, on reappearing, was greeted with three hearty cheers upon his success, and all went away delighted. In fact Mr. Maquay was more successful than even he anticipated. He only guaranteed that one balloon would raise ten tons, but the manner in which it dragged up the punt yesterday, laden to the extent mentioned, and overcame the suction which must exist between a flat substance sunk into greasy mud is a pretty convincing proof that it would have raised half as much again. It is calculated that to raise the *City of Launceston* it will require twenty cylinders and forty balloons, but more of course can be used if required.

UTILISATION OF SEWAGE.

A report for the year, ending on the 31st August last, has been presented to the board of directors of the Metropolis Sewage and Essex Reclamation Company, by the Hon. Henry W. Petre, under whose superintendence the operations on the Lodge Farm at Barking, where a small portion of the North London sewage is applied, have been conducted during the past year. From fifty to fifty-eight acres of the farm have been devoted to growing Italian rye-grass during the last two years. The crops thus obtained have not only been extremely heavy, but the quality has been good. Some sort of prejudice on this point seems to have existed, for the report says—"It is satisfactory to be able to state that the value of sewage-grown grass, both for horses and cattle, is beginning to be generally appreciated." Last year there was "much difficulty" in disposing of the surplus grass, whereas this season the demand has exceeded the supply. Messrs. Pickford and Co. have taken a regular supply of this grass at their stables, and pronounce it an excellent horse fodder. On the farm itself from fifty to sixty milking cows have been fed entirely on sewage-grown grass, with the most satisfactory results. Two young steers have also been fed exclusively on this produce since May 18th, and have increased greatly in weight while subject to this regimen. Still more important are the experiments which show the value of town sewage in producing crops of wheat, oats, and rye. Here, again, both quantity and quality were secured, the grain fetching a high price in the market. The experience gained at the Lodge Farm shows that sewage is fully applicable to cereal as well as to grass crops. It is suggested, however, in the case of wheat, that sewage should not be applied after the formation of the ear has commenced. This limitation does not appear necessary in regard to oats. Another valuable result relates to turnips. As soon as the oats and rye were removed, the land (so hard as to be impervious to the plough) was flooded with sewage, after which it was ploughed up and sown with white turnips. Within the week, without any rain, the turnips were up, and they have already been sold at £11 per acre. In the "experimental field" of the farm a piece of potatoes was planted on February 22, and twice flooded with sewage. This produced at the rate of 4½ tons, 5 tons, and 8 tons respectively, being dry during the months of June, July, and August, and fetching the top market price of the day. Red cabbage, planted out on April 10, and dressed with sewage three times, has been sold in August at the rate of £33 per acre. An acre and a-half of drumhead savoy, planted out in May, was valued in August at £35 per acre. Two or three floodings of sewage will produce such a crop of cabbage as can only be obtained by very heavy dressings of farm manure and the necessary amount of rain. Mangold-wurtzel sown in April has been calculated in August at 40 tons per acre. Two acres of strawberries actually produced £150, the quality of the fruit being attested by the award of the bronze medal at the Royal Botanical Society's show. The plant most reluctant to acknowledge the mixture of town sewage has been the onion, but even this has yielded to judicious treatment.

As to the value of sewage manure, Mr. Petre dispenses with the help of chemical analysis, and appeals to the agricultural results. With respect to grass, he observes that no amount of ordinary manure could produce six or seven crops in a season, weighing from six to twelve tons each. In the case of mangold wurtzel, two floodings of sewage, of two or three hundred tons per acre each, produce a crop weighing from fifty to sixty tons per acre; whereas a good dressing of farm-yard dung would only realize a crop weighing from twenty to twenty-five tons. Wheat also showes a decided advantage in favour of sewage.

Fine Arts.

Artistic Discoveries in France.—A portrait of Henry IV. of France, painted in the year 1599, by an artist named Jean Le Clerc, has recently been discovered in an old curiosity shop in Paris. At the back of the canvas is the following quaint quatrain:—

"Cy du bon roy Henry l'exacte pourtraicture,
Paincte en l'an mil six cents moins huict mois du Seygneur,
Par maistre Jean Le Clerc, d'apres franche nasture,
Gardez-en, bonnes gens, limayge en vostre quieur."

Those who have not studied old French will scarcely recognise the last word as *cœur*. The discovery has a double interest, first, on account of the life-like expression of the famous monarch's face, and, secondly, from the fact that the picture is the only known work of Le Clerc, who is believed to have been a pupil of Jean Cousin. Another discovery is that of a fine head of Christ, by one of the most remarkable artists of the sixteenth century, Ligier-Richier, born at St. Mihiel. Amongst this artist's works were a fine "Calvary," in the collegiate church of Hattonchâtel, in the Meuse. Scarcely anything remains of his productions; the head in question belonged to a large altar-piece in the church of St. Vierge, in the native town of the artist, of which only a fragment is now in existence.

Manufactures.

Ozone for Bleaching.—It is stated, on the authority of the *Produce Markets Review*, that ozone, one of the remarkable discoveries of Schönbein, whose death is recorded in this *Journal*, is being practically applied for the purposes of industry, an electric machine being actually employed in Whitechapel for the production of ozone on a large scale, to decolorise sugar, in lieu of filtration through animal charcoal, as hitherto employed.

Commerce.

The Brindisi Route.—A correspondent, writing to the *Perseveranza* of Milan, in answer to the question, "Why do not the English take advantage of the Brindisi route, which is the shortest and least expensive way to India?" says:—"The English do not travel by the Brindisi route because the greater part of them do not know that this route exists, or that it is shorter than the Marseilles route, and those few who do know of it are unable to obtain through tickets from London to Calcutta or Bombay or *vice versa*. Passengers from London to India, China, or Australia, prefer to take a through ticket, and to name their berths, consign their luggage, and to have no further trouble till they reach their destination. By the Brindisi route, on the other hand, passengers are obliged to take four or five tickets during the journey, to look after their luggage, and are subject to various other little annoyances, and, to save all this trouble, prefer the Marseilles route, which is longer. Until the Italian government has agencies in London and in India, where travellers would be able to book themselves and their luggage through to their destination, no one will prefer this route to the other. Out of 140 passengers on board the steamer from Suez to Ceylon six months ago, only one had come by the Brindisi route; and on the return voyage only two took this route from Egypt to London. Having frequently spoken with English travellers, both outward and homeward bound, on this subject, the reply has always been that they would be happy to avail themselves of the Brindisi route if agencies were only established in London and the various ports in the east, where they could take a through ticket. The Austrian Lloyd's, who do not neglect their own interests, have already opened agencies at Bombay, and at the principal ports in the east, where passengers can take through tickets *via* Trieste; and many travellers now pass by Trieste and the Brenner. One constantly sees passengers' luggage labelled *via* Marseilles, *via* Southampton, *via* Trieste, but rarely *via* Brindisi. If once agencies, where through tickets could be taken, were established in London, Bombay, and in the other parts of India, China, and Australia, there is no doubt that the Brindisi route would become the most frequented, but until this is done, and the railway service through Italy better organised, travellers will prefer the Marseilles route."

Colonies.

Victoria.—Metals raised.—The following is an estimate of the value of the metals and minerals raised in the colony from the first discovery of the gold fields to 31st December, 1867:—

Gold, 33,910,052¾ ozs.	£135,643,811
Silver, 12,591 ozs.	3,462
Tin	195,045
Copper	4,673
Antimony	30,426
Coal, 1,933 tons	2,899
Lignite, 235 tons	205
Kaolin, 1,757 tons	7,028
Flagging	18,663
Slates	508
Magnesite, 6½ tons	12
Diamonds, about 50 carats	80
Sapphires	150
	£135,906,962

The quantity of gold exported during 1867 was 1,433,687 ozs., of which 560,527 ozs. were from quartz veins, and 87,316 ozs. from alluvial workings.

Chinese in Victoria.—There were on December 31st, 1867, 15,629 Chinese miners in Victoria, principally engaged in alluvial mining. Last year, 1866, the number was 20,134, showing a decrease of 4,450. The following is a statement of the average earnings per man per annum for the past eight years, without distinction of classes:—

	£	s.	d.
1860	79	9	3
1861	74	15	11
1862	67	17	10
1863	70	4	2
1864	74	1	9
1865	74	4	2
1866	80	8	3
1867	87	1	7

The mean for the eight years is nearly £76 1s.

Revenue of New South Wales.—The following is the comparative statement of the revenue of the colony for the years ending 30th of June, 1867 and 1868 respectively:—

	1867.		1868.
Customs	£1,243,688	..	£1,376,140
Excise	48,732	..	57,665
Territorial	854,743	..	678,643
Public works	645,940	..	624,514
Ports and harbours	17,661	..	15,659
Postage	110,787	..	112,489
Fees and fines	73,151	..	66,372
Miscellaneous	44,192	..	40,360
	£3,038,894		£2,971,842

Obituary.

The Very Rev. Henry Hart Milman, Dean of St. Paul's, died on Thursday, September 24th, at Sunninghill, near Ascot, in the 77th year of his age. He was the youngest son of Sir Francis Milman, Bart., one of the physicians to George III. He was born in London, in 1791, and after passing a few years at Dr. Burney's Academy, at Greenwich, he went to Eton, and from there to Brazenose College, Oxford, were he graduated in due course. He was from the first destined to the Church, and in 1817, took orders, and soon afterwards received an appointment to the vicarage of St. Mary's, Reading. In 1821 he was elected Professor of Poetry in the University of Oxford, and about the same period was made

rector of St. Margaret's Church, Westminster. In 1849 Lord John Russell appointed him to the deanery of St. Paul's—a dignity which he held for nineteen years. Among the earlier fruits of his literary genius is a tragedy, entitled "Fazio," which was brought upon the stage, at Covent-garden, and in which Miss O'Neil took the part of the principal heroine. Another drama, but not adapted for the stage, appeared in 1820, entitled "The Fall of Jerusalem. His "Martyr of Antioch" was conceived in the same strain; and among his other poems were "Samor," "Belshazzar," &c. His first historical work was his "History of the Jews," which was published by Murray, in his "Family Library." From the date of this work, down to the close of his life, the time of Dr. Milman may be said to have been devoted to researches in ecclesiastical history. In 1840 he published a History of Christianity from the foundation of the religion to the separation of the Eastern and Western Churches; and about fifteen years afterwards appeared his History of Latin Christianity, in which he follows the fortunes of the Western branch down to and through the middle ages. In addition to these works, Dean Milman wrote several articles in the *Quarterly Review*. He also annotated a new edition of Gibbon's "Decline and Fall," in which he had M. Guizot as a coadjutor. His last published work was a splendid illustrated edition of Horace, much prized by scholars. He was elected a member of the Society of Arts in 1851, and so early as 1847 he took a special interest in the movement then set on foot for the erection of a "Memorial of the introduction of printing into England, and in honour of William Caxton." He has also presided on more than one occasion at the evening meetings, and in other ways shown his interest in the Society's objects.

William Meadows, the Prince Consort's Prizeman in 1867, was the son of Mr. J. D. Meadows, of Liverpool-street, Bishopsgate, and was born in October, 1847. He died on Tuesday, August 18th, 1868. He was educated at St. Thomas Charterhouse Schools, and was happy in the encouragement he received from the Rev. Wm. Rogers, M.A., the founder of those schools, to whose careful supervision during their scholastic career, and continued interest in their subsequent advancement, so many young men are indebted. Mr. Meadows had the pleasure of enjoying an agreeable intercourse with this gentleman till the period of his untimely death. In 1861 Mr. Meadows took the Silver Medal at St. Thomas Charterhouse. From that time till his death he obtained no less than nine certificates from the Science and Art Department, five from the City of London College, and fifteen from the Society of Arts, besides various prizes, as well as the Prince Consort's prize of 25 guineas. He entered the Customs in his 17th year, but was almost immediately transferred to the Educational Department, Privy Council Office, and his relatives have received from gentlemen in that office many tributes to his honourable and upright character.

Christian Friedrich Schönbein died a few weeks since. He was born at Metzingen, in Würtemberg, on the 18th of October, 1799. As a young man he passed some time in England and in France. In 1828 he was appointed professor of Chemistry in the University of Bâle. His name will ever be associated with two discoveries, which play an important part in modern sanitary science, in the extension of photography, and in military and civil engineering. His discovery of ozone took place in 1839, and that of gun-cotton and collodion in 1845.

Publications Issued.

Linear Drawing, showing the Application of Practical Geometry to Trade and Manufacture. By Ellis A. Davidson. (*Cassell, Petter* and *Galpin.*) This is the first of a series of books in connection with technical education.

Notes.

Technical Education.—At the election of the Lord Mayor for the City of London, on the 29th ult., Mr. John Jones, a liveryman, is reported to have said that what he desired to see was a revival of the powers of the great City companies, and those in particular which had reference to the promotion of the industrial arts over which they were once active presidents. Had those companies used their charters aright probably no trades unions would have been established in the country. It would be the duty of the incoming Lord Mayor—if he would govern that great City well—to lead forward the necessary movement of technical education, and he asked him to lend his assistance in pushing it on when the power of the chief magistrate was reposed in him. He would then be the chief representative of the arts of civilisation in this country; and they asked if, while fulfilling that office, they might expect from him on behalf of the nation, and especially of the apprentices to the various crafts, such an amount of co-operation and energy as would bring to something like a practical use the great funds in the hands of the livery companies of the City. Alderman James Clarke Lawrence, the Lord Mayor elect, said, in reply to the questions which Mr. Jones had put to him, he had a ready answer to give. With regard to the great subject of technical education, he believed it to be a growing one, and one in which the livery companies themselves would be disposed to take a deep interest. He knew of no object to which the growing funds of those companies could be better applied than to an extension of technical knowledge among the labouring classes of the metropolis.

Congress for the Discussion of the Methods of Teaching Drawing.—This Congress met last week, in the Hall of the Academies, at Brussels, under the presidency of the Minister of the Interior; there were present a large number of Belgian notables, besides foreigners, French, Dutch, and German. The Congress is divided into sections, one occupying itself with elementary education in drawing and its manual applications, and the other with superior education in the arts of design and the general means of encouragement. At the first meeting of the first section the two following questions were discussed:—"The introduction of drawing into all the primary schools, being considered eminently useful and desirable, what should be the special character and conditions of instruction?" "What are the best means to be adopted by the Government for ensuring the teaching of the principles of design in these schools?" Amongst the opinions and proposals put forth, was a suggestion for the establishment of conferences amongst teachers, in order to systematise the teaching of drawing, local competitions, provincial exhibitions, collections of models, &c. The third question, or rather group of questions discussed, was the following:—"What methods and processes are preferable for teaching drawing? To what stage should the employment of engraved copies be permitted before the pupil is allowed to draw from the round? Is it not essential to accustom pupils from the commencement to draw without the use of compass or rule? Is it not advantageous for the professor to give short explanations respecting the theory of shadows, the rules of perspective, &c., while the pupil is engaged in practising them? What works exist which may serve as guides in teaching the first principles of drawing?" The opinion of the Congress seems to have been decidedly opposed to the use of engraved or drawn copies. M. De Taeye, director of the Academy of Louvain; M. Van Marck, of Liege; M. Hendrickx, and other professors explained the methods employed in their schools for the teaching of drawing. The sittings of the Congress continue.

Palace of Fontainebleau.—The fine old palace of Fontainebleau is about to receive an additional wing, for the accommodation of the Imperial family. The plan of

the new buildings is now marked out in the Court of the Fountains; the new wing will enclose this fine court, with the grand gallery of Francis I., which now looks upon the water. This seems to be an unfortunate arrangement, for it is almost impossible to imagine, whatever may be the talent of the architect employed on the work, that the new building will harmonize completely with the older portions. Serious damage was done to the original design of the palace when the apartments occupied by the Emperor Napoleon I., and also by the present Emperor, were erected on one side of the curious gallery, now the library, closing the whole of the windows on that side. Should the new wing be erected as proposed it would be well to restore the library to its original condition.

Cheap Dining Places. — The *Pall Mall Gazette* says:—"Mr. Corbett's cheap dining places in Glasgow have not only fulfilled the most sanguine expectations of their benevolent projector, but have apparently been productive of a happy effect in a direction not originally contemplated. The cooks and attendants are all women, and their habits of neatness and culinary skill are so highly prized by the clerks and artisans of Glasgow, that Mr. Corbett finds he can seldom keep any of his girls beyond a short period. They are eagerly sought after as wives; out of 200 girls, not fewer than 24 have been married during the present year. It is pleasant to think of the immense amount of good they may do as a sort of missionary housekeepers among the working-classes, who are so sadly backward not merely in the niceties and comforts, but also in the economics of domestic life."

Effect of Lightning on Metals.—The following curious communication has just been made to the Paris Academy of Sciences. A woman was crossing a canal-bridge, near Nantes, when a powerful flash of lightning seemed, according to her own expression, to envelope her; she was not in any way injured, but the contents of her purse underwent an extraordinary change. A ten-franc gold piece was in the small minor pocket of the *portemonnaie*, and two silver coins in the larger division of the same. A certain quantity of the silver was vaporised by the action of the lightning passed through the leather lining of the purse, and was deposited with great uniformity on the gold coin, which had all the appearance of silver, while the surface of the silver coins had assumed the appearance of having been matted or frosted. M. Bobierre, who made the communication, said that he had examined the gold coin with a microscope, and found that the silver was uniformly deposited apparently in the form of globules, without any intervals between them. Having removed a small portion of the silver by means of a weak acid, M. Bobierre found that the surface of the gold coin had been affected, and presented a very different appearance to that produced by the coining press, and was, in fact, nearly in the same condition as the deposited silver; fusion had in fact commenced, but the effect had been instantaneous, and purely superficial.

The Mont Cenis Tunnel.—During the first fortnight of the past month (September) the progress made at the Mont Cenis tunnel was 52·40 metres; the length driven at Bardonnèche on the Italian side being 24·90, and that on the French side at Modane being 27·50 metres. The position of these works up to the 15th September was as follows:—

	Metres.
Length driven at Bardonnèche	5,186·00
Length driven at Modane	3,602·15
Total length of tunnel driven	8,788·15
Length remaining to be driven	3,431·85
Total length of tunnel	12,220·00

Encouragement to Provincial Science in France.—The minister of public instruction has just announced, that in the year 1870, a prize or prizes, of the value of sixty pounds, will be given by the government for the best archæological memoirs published in the journals of learned societies in the provinces, or sent by correspondents direct to the minister.

Supply of Milk to New York.—The yearly supply of milk for New York City is stated by the *Engineer* to be about 25,000,000 gallons. Of this quantity, 15,000,000 gallons come in as freight upon the Erie, Harlem, and Hudson River railroads; and the remaining 10,000,000 gallons are brought in by wagons from the adjoining counties, where the farmers make a speciality of the dairy business.

Correspondence.

Sanchi Tope, India.—Sir,—Fergusson's "Hand-book of Architecture" treats of these remarkable edifices from page 6 to 46. He has numerous illustrations and sections, and those of Sanchi in particular. He supposes that the two pillars at Solomon's temple in Jerusalem were after the same model, and belonged to Assyrian architecture.—I am, &c., James Cadbury.

Banbury, 19th September, 1868.

Patents.

From Commissioners of Patents' Journal, September 25.

Grants of Provisional Protection.

Baskets—2500—W. H. Hunt.
Brooches, &c., fastenings for—2416—A. Taylor.
Bungs, corks, &c., cutting—2574—J. Briggs.
Fabrics, &c., plaiting, &c.—2298—P. Tassie and I. Patchett.
File-cutting machines—2414—H. Moritz and J. Reinach.
Flax spinning machinery, bosses for—2350—G. R. V. Loughton and E. B. Jackson.
Pottery, &c., actuating machinery employed in the manufacture of —2552—A. J. and E. Leak.
Steel, &c.—2418—J. Heaton.
Vocal instruction in schools, instruments for facilitating—2230—R. Couty and J. Richard.

Patents Sealed.

1027. E. J. J. Dixon.
1028. J. T. King.
1030. M. B. Orr.
1034. W. Clark, jun., & J. Clark.
1035. M. Havenhand & J. Allen.
1038. W. D. Cliff.
1039 W. S. Page and R. East.
1040. B. Browne.
1041. S. Perry and F. Brampton.
1045. A. Warner.
1046. S. Holman.
1047. I. Bates and J. Taylor.
1048. A. Scott.
1050. F. Bauman.
1051. G. Hodgkinson.
1053. P. Adie.
1059. W. W. Hughes.
1061. H. Hughes and C. Jones.
1064. H. G. Warren, S. Stuckey, and P. Froud.
1068. W. J. Addis.
1069. W. E. Gedge.
1070. W. R. Lake.
1072. O. Ormrod.
1084. J. Walker and J. Wharrie.
1086. W. Austin.
1087. F. Taylor.
1089. J. Sinclair.
1098. H. H. Doty & G. Graveley.
1099. A. Scatchard.
1104. G. Davies.
1107. G. Kynoch & W. Whitehill.
1108. W. Clissold.
1115. A. Jackson and J. Hartley.
1116. H. Lafone and J. Nicholas.
1117. J. G. Dale and E. Milner.
1119. J. Napier.
1121. J. and T. Walmsley.
1131. J. V. Jones and G. J. Williams.
1133. W. Williams.
1139. F. A. Calvert.
1147. D. C. MacIvor.
1149. H. and J. Bryceson and T. H. Morten.
1155. M. A. F. Mennons.
1159. C. Desnos.
1161. A. V. Newton.
1214. M. A. F. Mennons.
1263. A. P. Price and J. A. Wanklyn.
1313. W. R. Lake.
1336. J. Rogers.
1415. S. Chatwood.
1775. J. Nuellens & M. Neuhaus.
1839. W. Firth.
2026. W. Sowerby.
2074. G. H. Wilson.

From Commissioners of Patents' Journal, September 29.

Patents on which the Stamp Duty of £50 has been paid.

2405. W. Watkin.
2432. W. Turner, S. Shore, and W. Halliwell.
2358. J. Whitehouse.
2499. E. Cottam.
2451. E. Brooke, jun.
2501. W. Schofield and J. Smith.
2503. C. F. Cotterill.
2449. J. W. Coburn.
2464. R. A. Brooman.
2488. W. E. Metford.
2524. D. Greig and R. Burton.

Patent on which the Stamp Duty of £100 has been Paid.

2398. G. Russell.